Attachment

PUBLIC COMMENTS OF NL INDUSTRIES ON THE PROPOSED PLAN FOR THE TARACORP SUPERFUND SITE, GRANITE CITY, ILLINOIS

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I. INTRODUCTION

NL Industries (NL) submits these comments for the public record for the Taracorp Site, Granite City, Illinois in support of the implementation of Remedial Alternative D. For the reasons set forth in this public comment, Alternative D is the most cost-effective remedy which will protect human health and the environment in accordance with CERCLA. NL will demonstrate that EPA's selection of recommended Remedial Alternative H violates EPA Interim Guidance on Establishing Soil Lead Cleanup Levels at Superfund sites and ignores site specific data and risk assessments which support the implementation of the 1,000 ppm clean-up level proposed in Alternative D. Furthermore, it is not justified by available scientific studies relevant to lead exposure and is technically infeasible. Finally, implementation of Alternative H will disrupt the Granite City community, and expose it to unnecessary adverse health, safety and environmental impacts.

Alternative H involves the removal and resodding of lead-bearing soils from a ninety-seven block area in Granite City, one of the largest projects undertaken by the Superfund program. Supporting technical and scientific data for this incredible proposal were not developed during the five-year remedial investigation/feasibility study conducted by NL with IEPA and EPA oversight. Instead, they were released less than two months ago, without review by the Illinois Department of Health or O'Brien & Gere, the engineering firm approved by EPA and IEPA to investigate the site and propose selected remedial alternatives.

The essential difference between Alternative H and NL's preferred Alternative D is the clean up level for lead-in-soil in residential areas. In general, Alternative H would clean up residential areas with soil lead above 500 ppm, while Alternative D cleans up areas with soil lead above 1,000 ppm. As these comments will demonstrate, the 1,000 ppm level proposed by NL is not only supported by EPA guidance and site specific risk assessment data, it will be fully protective of public health, particularly the health of children, who as a group have been shown to be more sensitive to lead.

Alternative D fully complies with EPA's Interim Guidance on Establishing Soil Lead Clean-up Levels at Superfund sites by employing three valid risk assessment approaches, including a site specific local blood lead study, a modified ADI approach for lead and a soil/blood lead correlation incorporating recent data on lead exposure. In contrast, EPA's Alternative H does not rely on site specific data, but instead on limited vegetable uptake studies irrelevant to Granite City conditions and outdated information on lead exposures. Moreover, the cost and implementation time of Alternative H has been underestimated by EPA and community impacts and technical feasibility concerns have been ignored. EPA's recommendation of Alternative H and arbitrary and capricious rejection of Alternative D without scientific or technical justification violates the letter and spirit of CERCLA, wasting precious Superfund monies with no additional benefit to the public or environment.

II. THE BACKGROUND AND HISTORY OF NL'S CONDUCT OF THE RI/FS AND PROPOSED REMEDIAL ALTERNATIVE.

NL voluntarily entered into an Administrative Consent Order ("ACO") for conduct of a remedial investigation feasibility study (RI/FS) with EPA and the Illinois Environmental Protection Agency (IEPA) in May, 1985. The ACO scope of work negotiated and agreed to by the parties required NL to undertake a site-specific risk assessment, incorporating previous sampling, blood tests and health studies undertaken at the site.[1]

During the next five years, NL fully complied with the terms of the order, conducting three separate site-specific risk assessments, supervised by U.S. EPA and subjected to peer

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1 The ACO also required compliance with the EPA Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA. This Guidance provides that:

a. the RI must be tailored to meet site-specific needs;

b. data generated must be evaluated in context of individual nature of the site; and

c. where ARAR's are unavailable, toxicity assessment should be based on reference doses. The weight of the evidence associated with toxicity information is a key element of this risk characterization.

review scrutiny. NL submitted the preliminary feasibility study report in August, 1989. It concluded that a 1510 ppm soil lead level for residential areas was protective of public health and the environment and conservatively used a 1,000 ppm soil lead level to select residential neighborhoods targeted for remediation.

NL received comments from U.S. EPA and IEPA on October 4, 1989, arbitrarily rejecting the previously approved and legally required risk-based approach to remediation of the site. The agencies instead proposed a 500 ppm level for residential soils and a 1,000 ppm level for industrial areas based on their interpretation of U.S. EPA Interim Guidance on Establishing Soil Lead Clean-up Levels at Superfund Sites issued in September, 1989. NL responded to these comments in compliance with the Consent Order on November 10, 1989, but U.S. EPA, without explanation, has refused to enter into dispute resolution to resolve the differences in the two approaches, in direct contravention of Paragraph 17 of the Consent Order.[2]

On January 10, 1990 U.S. EPA further breached the Consent Order by releasing NL's August, 1989 study, with an

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2 Paragraph 17 of the Consent Order required EPA to respond to NL's submittal within thirty days. EPA was further required to enter dispute resolution procedures if it did not approve NL's submittal. As of this date no response has been received and EPA has refused to enter into dispute resolution.

addendum prepared by EPA selecting Remedial Alternative H. As the following comments will show, this arbitrary and capricious rejection of Alternative D is not supported by the evidence.

III. NL'S RECOMMENDED ALTERNATIVE D FULLY COMPLIES WITH EPA'S INTERIM GUIDANCE ON ESTABLISHING SOIL LEAD CLEAN-UP LEVELS.

In September, 1989, after the preliminary feasibility study for the Taracorp site had been completed, EPA Headquarters issued Interim Guidance on Establishing Soil Lead Clean-up Levels at Superfund sites.[3] The Guidance sets forth an interim soil clean up level for total lead in residential areas at 500 to 1,000 ppm, which is adopted from a 1985 Center for Disease Control (CDC) Publication "Preventing Lead Poisoning in Young Children."

The CDC Publication itself does not recommend a clean-up level for lead in soil, however. Based on its review of lead exposure studies, it suggested that "lead in soil and dust appears to be responsible for blood levels in children increasing above background levels when the concentration in soil or dust exceeds 500 to 1,000 ppm." No indication is provided of the background level used or of any potential

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3 EPA's issuance of the Interim Guidance has been challenged by the Atlantic Richfield Company in a suit filed in the United States Court of Appeals for the District of Columbia, on the grounds that EPA failed to comply with notice and comment procedures for rulemaking when it issued the guidance.

occurrence of adverse effects following exposure to soil or dust levels in this range.[4]

Within this framework, the Interim Guidance explicitly provides that "site specific conditions may warrant the use of soil clean-up levels below the 500 ppm level or somewhat above the 1,000 ppm level," providing flexibility on either end of the range. It emphasizes that the Administrative Record supporting the clean-up level should include background documents on the toxicology of lead and information related to site-specific conditions.

EPA has ignored this flexibility inherent in the guidance, however, failing to recognize that a range of clean-up levels from 500 to 1,000 was provided so that site-specific factors may be taken into account. Instead of examining these factors and incorporating them into a proposed clean-up level, EPA seemed to randomly pick a 500 ppm level with no relation to site conditions. It has struggled to articulate the scientific reasons for selecting the 500 ppm level ever since. When compared to the laborious process undertaken by NL to support its 1,000 ppm level, this effort falls far short of EPA's legal responsibilities under CERCLA to

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4 Review of the CDC document makes clear that it never intended the 500 to 1,000 ppm level to be considered as a "recommendation" and adopted as a soil cleanup level. As the attached comments submitted to Jonathan Z. Cannon by ARCO demonstrate, there is no scientific documentation in the CDC document to support the interim cleanup level. See Exhibit A.

choose a cost-effective remedy which is sufficiently protective of human health and the environment.[5] EPA has provided no scientific justification whatsoever for its arbitrary rejection of NL's risk assessment which complies with the Guidance, the Consent Order and EPA policy.

A. NL's Risk Assessment Complies With The Guidance By Taking Into Account Site-Specific Conditions.

NL's risk assessment included an analysis and review of a local blood/lead study conducted by the Illinois Department of Health, a toxicology assessment based on a modified reference dose developed pursuant to EPA policy and a Soil Lead Blood Lead Correlation Approach. The risk assessment addressed site-specific conditions including ambient air concentrations in Granite City, dietary intake of Granite City residents and soil lead intake. All three approaches were arbitrarily rejected by EPA.

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5 Moreover, EPA asserted at the February 8, 1990 public hearing that it chose the lower end of the 500-1000 ppm range presented in the guidance in part because Granite City is an urban, industrial area, and therefore, the population may be exposed to other contaminants. This approach is unorthodox, unscientific and unsupported by the facts. First, there is no evidence in the record to indicate that there are other pollutants that threaten the health of the Granite City population, nor was any risk assessment conducted to evaluate the effects of other pollutants alone, or in combination with lead. Second, the literature is devoid of any reference to recommending a lower cleanup level of lead in soil where other pollutants are present, nor has EPA cited any scientific support for this synergistic approach. Thus, this statement, like much of what EPA relies on as support for its decision, does not withstand scrutiny.

1. The Illinois Department of Health Blood Lead Survey Provides the Best Information on Lead Exposure in the Granite City Community.

As part of its risk assessment, NL reviewed the data from the Illinois Department of Health (DOH) Blood Lead Surveys conducted during 1979 and 1982 summarized in the IEPA report "Study of Lead Pollution in Granite City, Madison and Venice, Illinois, April, 1983." This study, conducted while the Taracorp Smelter facility[6] was still in operation, found that "high absorption of lead is not occurring" in Granite City and there was no "unusual incidence of elevated blood levels."

The DOH blood-lead study provides the best and most relevant information to understand the relationship between lead-bearing soils surrounding the Taracorp site and any health risk to nearby residents from elevated blood-lead levels. EPA summarily rejected the data from this study, however, because it was conducted in November and December, when it believed residents were less likely to be outdoors. Using unreferenced values for blood lead declines, the Agency estimated the peak blood lead might have been 15 to 20% higher if the survey had been conducted in the summer or late fall. The U.S. EPA Review of the National Ambient Air Quality Standards for Lead (1989) cites data indicating that the half-life for clearance of lead from the blood of children is 10 months, however, with a rate

6 The Smelter facility was identified by IEPA as a major source of lead. It was shut down in 1983 and is no longer operational.

constant of 0.072 per month. Thus, in the absence of any external uptake of lead over the period in question (an obviously theoretical assumption in Granite City or elsewhere in the U.S.), blood lead should decline by only 7.2% per month. In other words, the mean blood lead level of 10 ug/dl reported in the IDPH report for November might have been 12.3 ug/dl in September, if no lead exposure had occurred in the three month period.

The IDPH report also contains data on the levels of free erythrocyte protoporphyrin (FEP) in blood. FEP is formed when zinc is incorporated into heme instead of iron during erthrocyte formation, due to the inhibitory effect of lead on the enzyme ferrochelatase (U.S. EPA 1986). It is a longer term indicator of lead exposure than blood lead, because the life of an erythrocyte is approximately 120 days. Thus, if lead exposure had actually been higher during the summer and early fall months as EPA alleges, FEP concentration should have been elevated during the November/December sampling period. It was not elevated, however, according to the IDPH survey, indicating that the results of the study were a valid indicator of blood lead, even for summer months when outdoor activity may be more frequent.[7]

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7 As IDPH points out in its report, one or two cases of elevated FEP should have been found in a sample of 46 urban children.

Therefore, the Agency's position that summer blood lead values may have been elevated relative to the time of the IDPH survey is incorrect, both because it uses an assumption of no significant exposure to lead over the period between summer and late fall (ignoring ambient exposure sources such as diet, house dust and air), and because FEP levels were not elevated.

Moreover, the blood lead and FEP testing conducted by IDPH indicate that soil lead concentrations in Alternative H's proposed remedial Areas 4-8 were not causing public health risks at that time. Therefore, the need to remediate these areas as proposed under Alternative H is not supported by the public health data.

Although a final report of the 1982 Granite City blood lead survey was never prepared by IDPH, summary tables of the survey were provided by IDPH, which break down data by age, sex, and location for both blood lead and FEP. Data for children aged 1 to 6 in Granite City were extracted for analysis (Exhibit B). Table 1 presents these data for the total 33 childrens' samples provided as a function of sectors of the study area EPA (Figure 4-5). The data show a decreasing trend in lead exposure with increasing distance from the Taracorp site, with mean blood and FEP levels of 17.1 to 33.5 mg/dl and 16.8 to 16.1 mg/dl for Sectors 2 and 3 respectively. Using the most recent guidance available for blood lead exposure parameter of concern (ATSDR 1988) with consideration of a proposed revision for blood lead of 15 mg/dl, none of the

33 children analyzed showed a combination of blood lead exceeding the current or proposed action level for lead exposure.

Furthermore, two predominant sources of lead in the study area - active smelting operations and use of the leaded automobile fuels were present at the time of the IDPH study, but are not present now. As discussed in Section III.A.3. of these comments, U.S. EPA (1989) has reported that the average blood lead levels of children have decreased from 14.9 ug/dl in 1978 to a projected 4.2 to 5.2 ug/dl in 1990. Therefore, blood lead levels of Granite City residents should have substantially decreased since 1982, meaning the values in the study are likely overstated.

2. The ADI Approach is an Acceptable Approach Given O'Brien & Gere's Development of a Modified Reference Dose.

In its comments, EPA criticized the Acceptable Daily Intake (ADI) Approach proposed in NL's risk assessment because the Agency has withdrawn its ADI for chronic exposure (ADIC) for lead. The new Risk Assessment Guidance for the Superfund Human Health Evaluation Manual (HHEM, 1989), however, provides guidance on the derivation of toxicity values even in the absence of EPA-verified values. It is possible to independently generate such values with the approval of the U.S. EPA's Environmental Criteria and Assessment Office (ECAO). As documented in previous correspondence submitted to this record,[8] such an approach was taken with the Granite City risk assessment, whereby the previous AIC was reduced by 40% in proportion to the anticipated lowering of the CDC level of concern for blood lead from 25 to 15 ug/dl. Dr. Michael Dourson of ECAO concurred that such an approach might be a reasonable alternative until additional guidance is forthcoming from the Agency.

The Agencies rejected the ADI approach, however, for Granite City, presumably because it assumes thresholds for lead. Such rejection may be based on the implied conclusion that there is no threshold effect level for lead in children, a position that is unsupported by the record or scientific principles. For example, a lowest observed adverse effect level (blood concentration) for lead in humans is cited by Madhavan et al. (1989) as 10 ug/dl (p. 137) because this level was the lowest associated with the inhibition of the enzyme ALAD (delta-aminolevulinic acid dehydrase), a key enzyme in the biosynthesis of heme. However, this inhibition is translated into decreased hemoglobin levels and anemia only at substantially higher blood lead levels -- 40 to 80 ug/dl -- based on a number of investigations reviewed in the ATSDR

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8 See December 16, 1988 letter to Mr. Brad Bradley and Mr. Ken M. Miller from Bonni Fine Kaufman, with attachments.

Toxicological Profile for Lead (draft 1988).[9] Thus, ALAD inhibition at 10 ug/dl should be viewed as a biological indicator of lead exposure, rather than an overt adverse effect. Given the existence of an appropriate threshold effect level of 25 ug/dl for lead or a proposed level of 15 ug/dl, the ADI approach is a valid method of risk assessment, supporting NL's proposed 1,000 ppm clean-up standard.

3. <u>The Soil/Blood Lead Slope Proposed in NL's Risk Assessment is Consistent with Recent Studies of Lead Exposures As Well As Recent EPA Air Policy.</u>

A critical review of post-1980 information on lead exposure indicates substantial decreases in baseline lead exposure, due primarily to the phasedown in leaded fuels and other lead uses. Since this phasedown beginning in the mid-1970's, there has been a dramatic decrease in the blood lead content of the United States population, as well as an apparently lower contribution of soil lead residues to blood lead content. As explained below, these contemporary data are more relevant to the remediation of the Taracorp site than the older studies relied upon by EPA and provide ample basis for the risk assessment's soil/blood lead slope.

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9 This would appear to be due at least in part to the observation that approximately 90% or more of ALAD activity can be lost without measurable effect on the rate of heme synthesis (O'Flaherty 1981, p. 287).

The original risk assessment for Granite City uses a soil/blood lead slope of 2 ug/dl lead per 1,000 ppm increase in blood lead. This slope was based on the analysis presented in EPA'S Air Quality Criteria for Lead (1986), which suggested that a slope of 2.0 ug/dl per 1,000 ppm soil lead may represent a reasonable median estimate for a soil/blood lead slope. Three recent empirical studies, Stark et al. (1982), Rabinowitz and Bellinger (1988), and Johnson and Wijnberg (1988) indicate that the relationship between blood lead concentrations and soil lead ranges from 0.6 to 1.8 ug/dl per 1000 ppm, indicating that 1,000 pm will be protective of public health at the Taracorp site.

First, Stark et al. (1982), conducted a study of the exposure of urban children to soil lead from 1974 to 1979 in New Haven, Connecticut using 153 children of age 0 to 1 year, and 334 children of 2 to 3 years, and soil ranging in lead content from 30 to over 7,000 ppm. An analysis in U.S. EPA's Air Quality Criteria For Lead (1986) of the data in this study gave a slope estimate of 1.8 ug/dl blood lead per 1,000 ppm soil lead. U.S. EPA identified this slope as a good median estimate of the relationship between soil and children's blood lead. It has been incorporated into the Granite City/Taracorp risk assessment slope of 2 ug/dl blood level per 1,000 ppm soil lead.

Second, Rabinowitz and Bellinger (1988) conducted a study similar to Stark et al. of a population of children in

Boston during 1981. The study used a sample size of 195 children aged 6 months to 24 months and a range of soil lead of 7 to 13,240 ppm. The population was divided approximately evenly into populations of children with more mouthing activity and those who were said to finger and hand mouth less, which was determined by a statistical analysis of psychologists' judgments on the frequency with which the children placed their fingers, hands, or foreign objects in their mouths. (This distinction is important as high hand to mouth activity may lead to relatively higher exposure to soil and dust lead residues.) The slope estimate for the less mouthing group was 0.57 ug/dl per 1,000 ppm (standard error of 0.2), and 1.6 ug/dl per 1,000 ppm of lead (standard error of 0.5) for the greater mouthing group,[10] once again less conservative than the 2 ug/dl per 1,000 ppm slope in the NL risk assessment.

Third, Johnson and Wijnberg (1988) conducted a study commissioned by the Centers for Disease Control in 1983 of children living in the vicinity of the ASARCO lead smelter in East Helena, Idaho. These investigators derived a slope

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10 Because the study population did not live in crowded conditions which might enhance exposure to leaded paint residues in soil near houses, the authors caution that the slope might be steeper under more crowded, urban environmental conditions.

estimate of 1.4 ug/dl per 1,000 ppm lead, with a soil range of 158 to 1,549 ppm studied.[11]

These recent studies, taken as a whole, show that the contribution of soil lead to children's blood lead may be substantially less than originally thought, validating the 2 ug/dl per 1,000 ppm slope used in NL's risk assessment.

Moreover, as reviewed and documented in the U.S. EPA Review of the National Ambient Air Quality Standards for Lead (1989), general lead exposures have been declining rapidly, not only because of the phasedown of leaded gasoline, but also due to the elimination of the use of leaded solders in metal food containers and the replacement of water distribution systems containing leaded solders. For example, estimates of mean dietary lead exposure in children was reported to have decreased from 52 ug/day to 8.8 ug/day between 1978 and 1990 (p. C-9). The U.S. EPA Review of the NAAQS for Lead (1989) was reviewed and approved by the U.S. EPA Clean Air Scientific Advisory Committee which estimated, through the use of a validated biokinetic lead exposure model and the 1978 NHANES II blood lead data, decreases in children's blood lead due to phasedown of leaded gasoline of 8.6 ug/dl, decreases in blood

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11 The data of Johnson and Wijnberg (1988) were also used by U.S. EPA (1989) to successfully validate its mathematical biokinetic model predicting blood lead levels in various age groups based on uptake, absorption and elimination rates via several physiological compartments and exposure routes.

lead due to decreased dietary lead exposure of 0.9 to 1.8 ug/dl, and decreases in maternal lead exposure producing decreased blood lead of 0.2 to 0.3 ug/dl. As a result, blood lead levels of 2 year old children in 1990 should average (geometric mean) from 4.2 to 5.2 ug/dl (compared with the average 1978 value of 14.9 ug/dl), and also from 3.5 to 5.8 ug/dl in adults (down from average values of 10.8 to 17.7 ug/dl) (see Table C-5, U.S. EPA 1989). These values, combined with the lower contribution from soil lead, and the fact that the IDOH blood lead study showed that residents of Granite City do not have elevated blood lead levels, indicate that the 1,000 ppm clean-up standard in Granite City will be fully protective of public health.

IV. THE INFORMATION CITED BY EPA TO SUPPORT A 500 PPM CLEAN-UP LEVEL IS IRRELEVANT TO GRANITE CITY CONDITIONS AND RELIES ON OUTDATED INFORMATION.

To support its preferred Alternative D, NL developed a three-pronged site specific risk assessment which has been updated by detailed information presented in these comments. In contrast, to justify its selection of Alternative H, EPA has relied on two generic vegetable uptake studies, an analysis of an outdated data set on lead exposure and a Superfund Record of Decision.[12] Upon review, it is readily apparent that these

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12 EPA has also referenced a draft ATSDR risk assessment of the Taracorp site. The ATSDR did not undertake a site-specific risk assessment for lead, however, it simply referenced the CDC guidance.

studies and the United Lead Scrap Record of Decision are completely irrelevant to conditions at the Taracorp site and do not provide a basis for a 500 ppm clean-up level. In fact, if the data in these studies are applied correctly, they support the 1,000 ppm level proposed in Alternative D.

A. The Results Of The Vegetable Uptake Studies Are Not Appropriately Applied To Granite City.

The first two studies relied upon by EPA, (Spittler and Feder 1979) and (Bassuk, 1986) examine vegetable uptake of lead and the methods to reduce such uptake. The Study of Lead Pollution in Granite City, Madison and Venice, Illinois conducted by IEPA in 1983, however, concluded that garden vegetables grown in the vicinity of the smelter do not appear to pose a significant risk. This site specific data should clearly take precedence over two generic vegetable studies that have no relation to Granite City soil conditions.

The IEPA study (1983) surveyed a variety a vegetables grown in Granite City gardens. As reported on page 37 of the study, vegetables grown in soils containing 53 to 97 ppm lead showed mean wet weight concentrations of 0.009 ppm, compared with 0.17 ppm for crops grown in soils of 1,100 to 1,500 ppm lead. In contrast, lettuce raised under greenhouse conditions by Spittler and Feder (1979) in 1,000 ppm soil lead contained approximately 3.1 ppm total lead (wet weight), almost 20-fold higher than the measured Granite City samples. Combining these data with an analysis of the dietary contribution of home-grown vegetables, and consideration of the limited extent of vegetable gardening in Granite City, IEPA (1983, pp. 38 and 48) concluded that vegetables did "... not appear to pose a significant risk as long as they are thoroughly washed before eating."(p. 48). Therefore, as will be shown below, the results of the Bassuk and Spittler and Feder studies are completely irrelevant to the derivation of soil lead remedial objectives for the Taracorp site.

1. <u>The Bassuk Study.</u>

The purpose of the Bassuk Study was to determine the effect of the phosphorus content in soil on lead uptake in plants as a function of soil lead concentration. The study used a soluble lead compound, $PbCl_2$, to determine lead uptake by lettuce.[13] In contrast, as stated on page 54 of the RI report, due to their smelting operation origin, the soil lead compounds at the Granite City site are likely to be oxides, sulfides, and mixed oxide/sulfates which are insoluble in water (Budavari 1989). Their insoluability is also indicated by the negative EP TOX results in the RI/FS from a soil sample with a total lead concentration of 3110 mg/kg (dry weight) (page 35 of the RI report).

Metal uptake by plants is directly proportional to the solubility of the metals in soil (Logan and Chaney 1983). Due

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13 The aqueous solubility of $PbCl_2$ is 9.9 g/L at 20/C (Weast 1973), making it a relatively soluble lead compound.

to their relatively low water solubilities, the uptake by lettuce of the lead compounds at the Granite City site will be lower than in the Bassuk study where $PbCl_2$ was used. The extent of lead uptake by lettuce plants determined using the more soluble $PbCl_2$ cannot therefore be used as a measure of uptake of the relatively insoluble Granite City site lead compounds.

Moreover, no data were provided in the Bassuk study on the simple relationship between soil lead concentration and the extent of lead uptake by the lettuce. All the data are concerned with the effect of phosphorus on this relationship. What would have been more relevant to the site would have been a determination of the relationship between lead in soil and lead uptake unconfounded by the added factor of the phosphorus. To ignore the effect of phosphorus and simply apply the data to the site as a guide to the relationship between soil lead concentration and plant uptake is not scientifically valid.

Finally, nowhere in the Bassuk study are there any data to support selection of 500 ppm lead in soil as an acceptable remedial level based on agricultural or other land use. In fact, the data provide no basis for differentiating between 500 ppm and 1,000 ppm soil lead remedial objectives based upon lettuce uptake.

2. The Spittler and Feder Study.

The Spittler and Feder (1979) study similarily cannot be used as a valid basis for setting Granite City site clean-up objectives. The study was designed to determine the relationship between lead uptake by various common garden plants and the concentration of lead in urban soils. While the results clearly show the dependence of lead uptake on soil lead concentrations under the study conditions, the design of this experiment makes it of questionable relevance to the Granite City site. Moreover, the failure to document study conditions which would increase the bioavailability of the lead studied means the results cannot appropriately be applied to Granite City.

The major problem with the Spittler and Feder study is that it was conducted in a greenhouse rather than a field setting. It has been shown that the uptake of certain metals such as Zn, Cd, and Mn by plants is up to 5 times higher in greenhouse studies than in field studies (Logan and Chaney 1983). It is probable that lead is also subject to this phenomenon and the amount of lead actually observed in the field (i.e. garden) would be expected to be lower than observed in the Spittler and Feder greenhouse study.

This "greenhouse effect" is the result of several factors. First, the use of NH_4-N fertilizers in pots in the greenhouse has the effect of lowering the pH of the soil directly adjacent to the plant roots. This results in higher metal solubility, and consequently greater bioavailability (Logan and Chaney 1983). Abnormal watering patterns and the relative humidity of a greenhouse contribute to this effect. In contrast, the maximum growth rates achieved within a greenhouse cannot be achieved in Granite City because such conditions do not exist naturally. Therefore, lead uptake in Granite City vegetables will be lower.

The description of study procedures presented in Spittler and Feder was clearly inadequate to determine whether the conditions responsible for the greenhouse effect were present. Consequently, the study results are not likely characteristic of growth conditions in a typical urban garden, but of greenhouse conditions that would result in higher uptake levels. Without specific details on study conditions, it is improper to rely on these data to predict garden vegetable lead uptake levels.

Moreover, several additional factors important for the determination of the bioavailability of lead in soil were not addressed in the study. The most important of these factors is the pH of the soil. As the soil pH decreases, the solubility of metal compounds typically increases, causing an increase in bioavailability (Logan and Chaney 1983). No soil pH data were given in the study. Without such data, it is not possible to use the study to predict the extent of lead uptake by plants in other areas, including Granite City.

As the Bassuk (1986) study demonstrated, the concentration of phosphorus in the soil also has a pronounced effect on the extent of lead uptake by lettuce. Specifically, as the concentration of phosphorus in soil rises, the amount of lead taken up by lettuce decreases. Since Spittler and Feder (1979) did not measure the phosphorus concentration of the soils used to conduct their study, it is not possible to determine how widely applicable their data are. This is a particularly critical point, because serious vegetable gardeners routinely amend their soils with organic and inorganic fertilizers, mulches, and other additives, the majority of which would act to reduce lead solubility and plant uptake.

The study also fails to analyze the nature of the lead compounds that were accumulated from the soil by the crops. The lead compounds at the NL Granite City site are relatively insoluble, having been weathered in the years since their original release as a result of smelting operations. The lead compounds contained in the soils used by Spittler and Feder were likely derived from lead paints and auto exhaust. In the case of auto exhaust at least, the lead compounds are likely halides and mixed lead halide/ammonium halide double salts (U.S. EPA 1986), which will be much more soluble than the NL Granite City site lead compounds (Budavari 1989), and therefore have greater bioavailability.

The final problem with EPA's reliance on this study is that the study contains absolutely no rationale or support for selecting the 1000 ppm and 500 ppm advisory soil lead levels. These guidelines were simply stated to have been recommended to the Boston Gardening Community. There was no assessment of the risks that pertain to such soil lead levels and they were presented without derivation. Based on the lack of substantiation for the selection of these levels, and the fact that the experiment conditions under which the study was conducted were not similar to conditions at the Granite City site, the use of this study to set lead clean-up levels for Granite City is clearly not supported by the data presented. The obvious conclusion is that the IEPA study of the Granite City garden vegetables is a more appropriate site-specific site evaluation of lead uptake in Granite City vegetable gardens.

a. Application of the Spittler and Feder results to Granite City shows no increase in lead exposure.

Even if one were to accept Spittler and Feder's uptake calculations for lettuce and other vegetables, which is clearly not recommended, the following calculations show that the resultant blood lead increase projected by the study for Granite City residents is not of concern. Spittler and Feder's study shows that lettuce grown in greenhouse conditions in Boston garden soil at 1,000 ppm lead contained 55 ppm dry weight, and 3.14 ppm wet weight. Values for 500 ppm were 30 ppm dry weight, and 1.71 ppm wet weight. Values for radish tops (a possible surrogate for other vegetable types) were approximately 50% of the lettuce values, and radish root even less. The EPA Exposure Factors Handbook (EFH 1989) summarizes adult dietary intakes as 200 g per day of total vegetable consumption, 40 g of which are lettuce. The handbook also presents a reasonable worst case, whereby 80 g per day of vegetables are homegrown over 50% of the year, or 40 g per day on a yearlong basis (10 g as lettuce). Thus, for a garden plot containing 1,000 ppm soil lead, the increase in blood lead due to consumption of the garden vegetables is as follows:

	ppm fresh weight	ug Pb/ingested/day	increase blood Pb*
lettuce	3.1	31	0.99
other vegetables	1.5	45	1.44
Total		76	2.33

* U.S. EPA (1989): blood lead increases 0.032 ug/dl per ug lead ingested for adults

The increase at a corresponding 500 ppm soil lead would be approximately 1.2 ug/dl.

It is not probable that young (ca. 2 year old) children would consume fresh vegetables at these rates. A 7 kg child (10% adult weight) who did so proportionally on a body weight basis would ingest 7.6 ug lead per day, and absorb 3.8 ug approximately. The children's relationship between absorbed lead and blood lead is 0.38 ug/dl per ug absorbed (also from the U.S. EPA (1989) OAQPS biokinetic model) or 1.4 ug/dl blood lead increase at 1,000 ppm soil lead and 0.7 ug/dl at 500 ppm. In the context of projected baseline blood lead of 5 ug/dl and the exaggeration of lead/plant uptake by the Spittler and Feder study design, these estimated increases in blood lead are of no concern. Therefore, neither the study nor its predicted impact in Granite City provides a basis for a 500 ppm soil lead clean-up standard.

B. The Madhavan Study Is Drawn From A Biased Sample Of Outdated Studies And Does Not Support EPA's Clean-Up Standard.

The third study, (Madhavan, Rosenman & Shehata) cited by EPA to support Alternative H relies entirely upon older, pre-1975 data on lead exposures and ignores more recent data suggesting that the contribution of soil lead to children's blood lead may be substantially lower than originally thought. As discussed in the preceding section, downward trends in the level of lead exposure in the United States render the Madhavan conclusions of questionable contemporary significance. In addition, the study selection method used by Madhavan et al. was biased and used an invalid data point.

Madhavan et al. used a compilation of studies on blood lead and soil exposure conducted primarily before 1975 contained in Duggan (1980). In Duggan's analysis of the available literature, 21 blood lead/soil and/or dust lead correlation studies were listed, with correlation slopes for the contribution of soil and/or house dust lead, ranging from

1.6 to 14 ug/dl per 1000 ppm soil lead (some of which represent averages of replicate studies within a single cited source). Duggan (1980) selected 19 of these values which showed a statistically significant difference in the range of soil lead concentrations measured, and derived an estimated increase (both arithmetic mean and median) of the order of 5 ug/dl per 1000 ppm of soil or dust lead (p. 316).

Madhavan et al. selected only 8 of the 21 individual blood lead/soil lead correlation estimates, ranging from 0.6 to 65.0 ug/dl per 1000 ppm, from the Duggan compilation for their analysis. The intent was to isolate uptake in children less than 12 years of age ("... the most susceptible group to lead toxicity"...) and to eliminate the influence of other sources of lead exposure (house dust was cited, p. 138). No other justification was provided for the selection of these eight values. In fact, Duggan (1980, p. 312) notes that there was no clear separation of the slope values seen in soil studies vs. house dust studies. This opinion was confirmed by U.S. EPA (1989). Thus, the basis for study selection in the Madhavan et al. analysis is questionable, particularly the exclusion of house dust studies because these studies would include lead from the soils as well. This diminishes the statistical confidence of the resulting estimate of slope.

Madhavan et al. also determined a geometric mean (based on an assumption of lognormal blood lead distribution) for the 8 studies taken from Duggan (1980) of 3.41 ug/dl per

1000 ppm soil lead with a geometric error of 1.75 ug/dl. An upper bound 95% confidence limit of 8.5877 ug/dl per 1000 ppm is reported. Examination of the table in Duggan (p. 313) from which the 65.0 ug/dl per 1000 ppm value (from the Angle et al. reference) was selected by Madhavan indicates that the soil lead residue range was considerably less than 1000 ppm (97 to 219 ppm), and that the variation was not considered statistically significant. Thus, this value cannot be considered a "slope" describing the incremental contribution of increasing levels of soil lead to blood lead, as mistakenly represented by Madhavan et al. (p. 139, Table 1). It represents only an estimate of blood lead obtained by extrapolation from a single soil lead level typical of urban background levels, and measured blood lead levels of 14 to 22 ug/dl, to a hypothetical soil lead level of 1000 ppm.

Derivation of a valid correlation slope requires that the independent variable(s) be measured over a statistically significant range of values, encompassing the entire range of interest. It is therefore inappropriate to include the value of 65.0 ug/dl per 1000 ppm in the statistical treatment of estimated slopes, because it is not a slope. Neither Duggan (1980, p. 316) nor U.S. EPA (1986) included this value in their analyses of soil lead uptake in children. Furthermore, 65 ug/dl of children's blood lead represents a potential effect level for lead toxicity in children for effects including anemia and neurotoxicity (ATSDR 1988, CDC 1985). Such readily observed toxicity indicated in Madhavan et al. to be associated with soil lead levels of 1000 ppm is not consistent with public health investigations conducted in Granite City (as reviewed in the Granite City RI report), which did not reveal elevated lead exposure. Nor is it consistent with clinical manifestations of toxicity noted in other reviews, including CDC (1985) and EPA Air Quality Criteria for Lead (1986).

Excluding the highest value in the Madhavan et al. (1989) data set from the calculation (65.0 ug/dl per 1,000 ppm), reduces the 95% upper confidence estimate of the slope to 4.52 ug/dl (Madhavan et al. 1989, p. 140)). This would correspondingly increase the maximum permissible soil lead level derived by the Madhavan et al. (1989, p. 140) approach to 1200 ppm, rather than the 600 ppm level proposed in the study. This soil lead level is clearly inconsistent with the 500 ppm level proposed by EPA.

The Madhavan study has also erroneously assumed that lead uptake is linear with concentration to reach their proposed 600 ppm level. Madhavan et al. presents a table which assumes a linear relationship between blood lead and soil lead down to a slope of 1 ug/dl per 116 ppm soil lead. The basis for this assumption of linearity, however, is not provided. In fact, in citing the Centers for Disease Control (CDC, 1985) review of some of the same information utilized by Duggan (1980), Madhavan et al. appear to contradict their own assumption of linear uptake. Specifically, CDC concludes: "In general, lead in soil and dust appears to be responsible for blood lead levels in children increasing above background level when the concentration in the soil or dust exceeds 500-1000 ppm." This statement clearly suggests that soil lead of less than the 500 to 1000 ppm range does not result in observable blood lead increases.

Choosing 5 ug/dl as a "tolerable" level of blood lead to be added to baseline blood lead, Madhavan et al.(1989, p. 140) present the associated value of 600 ppm of soil lead from their linear analysis as a protective level, adding the 5 ug/dl incremental blood lead increase to 1976 - 1980 baseline blood lead medians of 16 and 20 ug/dl. Since the U.S. EPA Review of the NAAQS for Lead (1989) determined that 1990 blood lead values in children should be of the order of 5 ug/dl (p. C-14) the 600 ppm level is obviously significantly overprotective.

1. A correct analysis of the Madhaven data supports the 1,000 ppm clean-up standard.

Utilizing data from Stark et al. (1982) and Rabinowitz and Bellinger (1989), further supported by the CDC's ASARCO study (Johnson and Wijnberg 1988), as well as estimates of current base-line lead exposure, it is possible to utilize the approach of Madhavan et al. to derive an alternative clean-up objective for soil lead in Granite City based on more contemporary data.

Rounding the slope of the Stark et al. (1982) and the Rabinowitz and Bellinger (1988) high mouthing behavior study group to 2.0 ug/dl per 1,000 ppm lead, and adding 1.0 ug/dl (two standard errors on the geometric mean of the Rabinowitz and Bellinger (1988) study), it appears that exposure of a child with high hand to mouth behavior to soil lead levels of the order of 1,000 ppm will add approximately 3.0 ug/dl to baseline blood lead as an upper bound estimate using contemporary data.[14] In view of recent projections (U.S. EPA 1989) that the national mean baseline blood lead concentration in young children may be up to 5.2 ug/dl (geometric mean), an upper bound estimate of childrens' blood lead resulting from exposure to 1,000 ppm soil lead appears of the order of 8.2 ug/dl. This level is below the blood lead level of 10 ug/dl incorrectly cited by Madhavan et al. (1989) as a lowest observed adverse effect level based on ALAD inhibition, and

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14 Madhavan states that data on estimates of the amount of soil ingested by children show a 100-fold variation and thus are not useful in deriving a "safe" soil level for lead. Therefore, Madhavan et al. use information only on the relationship between blood lead concentration and soil concentration to derive their criterion. However, the sources cited by Madhavan et al. (1989) show good consistency in estimated soil ingestion rates (EFH, 1989). Both the Binder et al. (1986) and Clausing et al. (1987) studies directly measured children's soil ingestion in controlled experiments, and show less than a two-fold variation in mean daily soil ingestion rate (127 - 230 mg/day). Thus, an additional approach to lead exposure analysis was rejected incorrectly, even though U.S. EPA (1989) successfully used such an approach in developing its validated biokinetic lead exposure model.

considerably less than the 25 ug/dl represented by these authors to result from exposure to the 600 ppm maximum permissible soil lead level under the worst case conditions presented in that study.

A margin of uncertainty of approximately 2 ug/dl or more thus exists between the upper bound blood lead estimate of 8.2 ug/dl for exposure to 1,000 ppm soil lead and the Madhaven et al. 10 ug/dl lowest observed effect level for ALAD inhibition. This will allow for protection of site-exposed individuals who are at the upper end of both the 1990 baseline blood lead distribution (estimates of the geometric standard deviation were not available for the current mean estimate but are most likely to be less than the 1978 value of 1.4) and soil lead uptake distribution from overt lead toxicity (as opposed to ALAD inhibition alone). In consideration of the fact that the baseline blood lead already contains a contribution from baseline soil exposure of approximately 1 to 1.5 ug/dl from background soil lead of 180 ppm (calculated from Table 4-2, U.S. EPA 1989), the 1,000 ppm soil lead residues at the Taracorp/Granite City site will not represent a source of adverse health effects for the worst case exposure population.

C. <u>The Cincinnati Work Plan Cited By EPA As Support For Its 500 ppm Level Also Has No Bearing On Granite City Conditions.</u>

EPA has also cited the Cincinnati Soil Lead Abatement Work Plan as support for Alternative H. The Work Plan was developed as part of the Cincinnati Soil Lead Abatement Demonstration Project, one of three such projects authorized by Section III(b) of SARA, which provides for: "a pilot program for removal [and] decontamination ... with respect to lead-contaminated soil in ... metropolitan areas." See generally Clark, et al., "The Cincinnati Soil-Lead Abatement Demonstration Project" (1989).

EPA's reliance on a lead-in-soil level used in a pilot program as authority for the selection of a cleanup objective for a National Priority List site is misplaced. The scientists carrying out the pilot study design their experiment to suit their hypotheses, and are free to do so with no regulatory, statutory, or other legal constraints. They could choose to examine the impact of absolutely any level of lead-in-soil. In contrast, in selecting a remedy for the Taracorp/Granite City site, the EPA must comply with the National Contingency Plan, Section 121 of SARA and the Consent Order.

Moreover, the Cincinnati project is designed as a research program to address several questions, first and foremost: "Does soil lead and exterior dust abatement in rehabilitated [lead paint-free] housing ... result in a statistically significant reduction in blood lead of children relative to children ... in a control area...?" Clark, at 292. The researchers would be inclined to abate lead-in-soil to a relatively low level, to insure that there will be a real statistically significant difference between the experimental and control groups. It does not follow at all that the pilot program cleanup level should be applied to Superfund sites. To the contrary, funding of the pilot program may indicate Congressional awareness of the need for research in this field, and the lack of scientifically established remedial references.

Even if the Cincinnati work plan cleanup were carried out in Granite City, it does not go as far as Alternative H. The excerpts from the Cincinnati Work Plan state that the study areas selected had "the presence of a minimum [undefined] number of children under four years of age and the presence of lead contaminated soil" (p. 4-27). Thus, unlike Alternative H, which proposes a universal cleanup without reference to a protected population, the Cincinnati pilot program targets children under four years old. No such differentiation among affected residents has been proposed in Alternative H, indicating a substantial degree of overprotection at an extremely high cost.

D. EPA's Reliance On Other Records Of Decision To Select A Cleanup Level For The Taracorp Site Contravenes The Interim Guidance And Is Scientifically Inappropriate.

The purpose of the Interim Guidance is to require a site-specific analysis for selection of a clean-up level. EPA's asserted reliance on other Superfund Records of Decision (RODs) to select a clean-up level for Granite City not only contravenes this policy, but leads to an absurd result. This is obvious when the United Scrap Lead ROD is carefully analyzed.

The United Scrap Lead site only required removal of 1600 cubic yards of soil to achieve a 500 ppm level. In contrast, Alternative H would require removal of approximately 160,000 cubic yards of soil, resulting in adverse impacts to the community which were never considered at the United Scrap Lead Site. Moreover, since the United Scrap Lead site is located in a rural area, any adverse impacts from excavation and disposal of soils on the population would be minor, as opposed to Granite City, where the area to be remediated is densely populated. The United Scrap Lead site had additional pathways of potential exposure as well, via surface water and groundwater, which are not present in Granite City. Clearly, EPA's reliance on this ROD to support its 500 ppm clean-up level falls short of any reasonable scientific justification.

V. ALTERNATIVE H IS NEITHER COST EFFECTIVE NOR TECHNICALLY FEASIBLE.

EPA's premature release of Alternative H prevented O'Brien & Gere, the engineers approved under the Consent Order, and the persons with the most knowledge and expertise about site from finalizing the feasibility study. Therefore, cost and technical data supporting EPA's proposed Alternative H were not analyzed by O'Brien & Gere before they were released to the public. As a result, the cost of Alternative H and time period for implementation have been significantly underestimated by EPA and technical roadblocks to implementing this Alternative were completely overlooked.

EPA's fact sheet on clean-up alternatives estimates that the total cost for implementing Alternative H is $25 million. The implementation time is proposed to be 1.5 to 2.5 years. The actual cost of Alternative H will be close to $30 million with an implementation time of 7 years. In contrast, Alternative D is estimated to cost $6.8 million with an implementation time of 1 to 2 years.

The assumptions and methods used by NL to calculate the actual cost and implementation time for Alternative H are explained below.

A. <u>Cost Estimate</u>.

To determine the impact of adding the additional residential properties to the remediation area proposed in Alternative H, each block identified by the USEPA was evaluated by O'Brien & Gere. Aerial photographs taken during 1988 were generated at approximately 100 scale and the area occupied by each block (curb to curb) was calculated. In addition, estimates were made on the amount of unpaved surface on residential lots or alleys adjoining those lots. Exhibit C presents a Figure with the numbered blocks as well as a Table which includes the estimated unpaved residential surface area targeted for remediation.

The estimated cost of $30 million assumes a pavement to sod ratio of 1:2 to reflect the residential driveways and the unpaved alleys through the middle of many blocks. The unit costs for excavation were based on excavation of 50% of the material by small equipment (Bobcat or equivalent) and 50% manually. A drive-by survey of the targeted areas suggests that the teaming of laborers with a light piece of equipment is the method the contractor would use. The combined excavation cost derived from Means 1989 Site Work Construction Cost guide (Means) averaged $31/CY. For the purposes of the Feasibility Study a combined cost of $45/CY was presented. The incremental cost was added to reflect reduced production resulting from tight working conditions associated with minimizing damage to property and shrubs, as well as anticipated supplemental safety requirements. Restoration costs were based on site specific information and unit costs included in Means (see Exhibit D).

Exhibit D presents the detailed cost estimate for Alternative H using the same presentation format that was used in the Preliminary Draft Feasibility Study. The total estimated cost of $30 million prepared using these methods is approximately 20% higher than the EPA's published value. The difference in costs is due to the methods utilized to estimate areas for remediation. O'Brien and Gere conducted a block by block tabulation of the area from aerial photographs while EPA simply scaled up the costs developed by O'Brien & Gere for Alternative D. In addition, EPA's estimate does not appear to include costs for remediating unpaved alleys and sidewalks in residential areas. Although a 20% deviation in costs during the Feasibility Study is within the range expected at this stage in the project, the actual difference of $5 million is substantial. For budget purposes a $30 million value is considered more appropriate than the $25 million value proposed by the U.S. EPA.[15]

B. Implementation Time.

The USEPA's fact sheet estimated that the implementation of Alternative H would require 1.5-2.5 years. Prior to the Public Hearing, calculations were conducted to provide an indication of project duration. Those calculations resulted in approximately seven years from authorization to begin design to contract closeout. The project duration can be separated into three phases: design, excavation/transport, and installation of the Taracorp Pile cover.

1. Design.

Final design will require supplemental sampling of each of the residential properties according to EPA comments at the February 9, 1990 public hearing. The areas to be evaluated include somewhat in excess of 1600 residences based on the aerial survey. Obtaining access for sampling, sampling, analyses, data validation and reporting is expected to take at least six months. Preparation of design documents, bid

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15 The $30 million figure does not include any additional monies necessary to purchase additional property for the expansion of the Taracorp pile proposed in Alternative H. See Section V, D.

preparation, contractor selection and award is expected to take an additional six months. This results in a one year design process.

2. Excavation/Transport.

The excavation and transport of approximately 160,000 cubic yards of soil to the Taracorp Pile is the major component of this project. Movement of SLLR piles and the removal of contained lead bearing wastes to recycling facilities are expected to require a short period of time and be able to be conducted simultaneously with other activities. Therefore, these activities were not factored into the estimated time frame.

A preliminary time estimate was prepared prior to the February 8 public meeting, by evaluating the production of a work crew consisting of four laborers, and an equipment operator using production rates quoted in Means. The results suggested that each residential property might require 5 days to complete the excavation of 6 inches of soil, replacement of 6 inches of soil, sodding/paving, and the replacement of shrubs as well as other incidentals. NL Industries' experience with similar cleanups suggests that the actual time might be closer to six days/residence. For preliminary estimating purposes a value of 5.5 was used. Remediation of 1690 estimated properties results in 9300 work days for a single crew. This is equivalent to 53 years when corrected for a five day work week, 50 week work years, and 70% of the work days suitable for construction (reasonable weather conditions).

While sequence of construction will be determined by the contractor, for an initial estimate it was assumed that a particular work crew would have responsibility for both excavation and restoration of a given property. Each crew could send an estimated three truckloads of soil to the Taracorp pile/day during the 3.5 days estimated for excavation at each property. Using a round trip time of 1 hour between arrival at the residence for soil pickup and return to a residence for soil pickup results in eight 10 CY loads per day. Therefore, a truck could service three crews during excavation.

The number of crews which could work simultaneously may be limited by Granite City and would also be limited by truck access to the Taracorp Pile. Concerns raised at the public hearing suggest that vehicles leaving the Taracorp site will likely have to go through sufficient decontamination to prevent tires from tracking dust throughout the city. It was assumed that the time required to enter, dump, decontaminate, and leave the Taracorp site was 20 minutes. Using the staging/decontamination locations limits truck traffic to 48 loads per day. This traffic loading would allow a maximum of 16 crews to be excavating at any given time. Because the loading and unloading is unlikely to be perfectly scheduled, it was assumed that the contractor would elect to use twelve crews and thus minimize truck waiting time at the pile.

Applying twelve five man crews to the project supported by four full time trucks, resulted in an estimated residential excavation time of 53/12 or 4.4 years. Additional time will be required to excavate material from the alleys in Venice Township and Eagle Park Acres. Based on these calculations, an excavation/restoration period of 5 years was estimated.[16]

3. Installation of the Cap.

The time required to cap and close the pile after the soil transport is completed is estimated at one year. This time frame would include finish grading of the pile, installation of the two foot clay barrier, the synthetic membrane, drainage layer, filter fabric, root zone, and seeded topsoil. This assumes that during the soil transfer operations compaction and grading were ongoing with only marginal modifications expected during cover installation.

The time required to complete Alternative H within the budget estimate of $30 million is thus estimated at

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16 The time frame is substantially more than 1.5-2.5 years estimated by the USEPA. The USEPA did not provide any calculations to support the proposed implementation schedule, therefore, critical review is impossible. However, given the geometry of the existing Taracorp Pile, its relationship to 16th and State Street, and the need to minimize dust tracking through the city, it is unlikely that truck throughput could be increased substantially beyond that assumed. Using this method of estimating and crew size, the time frame to do a city block would range from 2-3 weeks depending on the block size.

approximately seven years, compared to one to two years for Alternative D. This increase is not unexpected when one considers that the estimate for Alternate D of 1-2 years includes only 220 residential properties to a depth of 3" while Alternative H includes 1690 properties to a depth of 6".

C. EPA Failed To Consider The Technical Infeasibility Of Implementing Alternative H.

Even more eggregious than the errors in EPA's cost and implementation time estimate is EPA's failure to address the technical obstacles to implementation of Alternative H. Alternative H proposed to dig up soils from Areas 3 through 8 with lead levels greater than 500 ppm in residential areas and place the soils on the existing Taracorp pile. The pile will then be capped. EPA has erroneously assumed, however, that excavated material can be disposed on the Taracorp pile. The placement of an additional 160,000 cubic yards of soil on an 85,000 cubic yard pile will violate USEPA guidance for side slopes on waste piles[17] and impair the physical integrity of the site. Therefore, EPA's option is to purchase the adjacent lot occupied by TriCity Trucking for disposal (which is in a 100 year flood plain) or dispose of the additional soil off-site. Off-site disposal will increase the cost of Alternative H by an additional $5 million. Expansion of the Taracorp pile into a flood plain is truly nonsensical, if the

[17] EPA 625/6 - 85/006 at p. 3-20.

purpose of this project is to prevent releases of lead into the environment.

Moreover, EPA's proposed Alternative H results in a five-fold increase in the areas to be remediated when compared to Alternative D. This enormous area of off-site remediation was never contemplated by O'Brien & Gere, and was only proposed by EPA after O'Brien & Gere's RI/FS work had been completed. Consequently, the remedial investigation does not include enough data points to identify and define the appropriate extent of Areas 4-8 to be remediated.

EPA's remedial Alternative H partially relies upon "Soil A" sample data selected from the "Study of Lead Pollution in Granite City, Madison and Venice, Illinois" (1983), p. 28-30. The IEPA report presented four distinct soil sample classifications or groups. "Soil B" samples, "which were *intended to indicate levels to which children would most likely* be exposed, were taken from open dirt areas in yards, playgrounds, etc." The soil B samples split between IEPA, IDPH, and USEPA were not considered during the development of Alternative H, however.

Moreover, the biased limited sampling data offered by USEPA to support such remediation was not reviewed in the RI. Amazingly, EPA has relied on only five residential soil samples to require the remediation of almost 600 residences in Area 4, and seven soil samples for the remediation of Area 8, which includes over 600 residences. It is clear that such limited sampling provides an insufficient basis for the massive scale soil removal program proposed by EPA in Alternative H.

VI. ALTERNATIVE H'S INCREASED RISK TO RESIDENTS AND ADVERSE IMPACTS ON THE COMMUNITY AND THE ENVIRONMENT ARE NOT JUSTIFIED BY THE MINIMAL PROTECTION IT PROVIDES.

Implementation of Alternative H will result in the excavation and disposal of 160,000 cubic yards of soil compared to 23,000 cubic yards for NL's proposed Alternative D. EPA admits that the "amount of digging required could expose the community to contaminated dust." (EPA Clean-up Alternatives.) What it has not analyzed or made clear to the public is that Alternative H will have significantly more adverse community and environmental impacts than Alternative D.

First, Alternative H will require almost 40,000 Dump Truck Traffic loads traveling on Granite City streets, compared to 6900 loads for Alternative D. This results in a 600% increased risk of traffic fatality or injury -- which is a far more adverse impact than any increased lead exposure from a 1,000 ppm rather than 500 ppm clean-up level. Moreover, the adverse impact from air pollution due to vehicle emissions and unavoidable lead emissions from soil in dumptrucks as they travel through Granite City roads has not been considered.

Furthermore, excavation of this enormous volume of soil will have substantial construction impacts on the community with little benefit in return. Residents will be subject to noise, debris, traffic, parking restrictions, dust and the general inconvenience of construction for several years as the project proceeds. It is difficult to even imagine the scale of a soil removal program encompassing 97 city blocks, let alone the consequences for the residents living through it.[18]

Section 121(b)(1)(b) of CERCLA, 42 U.S.C. § 6921(b)(1)(b), requires that when assessing remedial actions EPA shall, at a minimum, take into account the potential threat to human health and the environment associated with excavation, transportation, and redisposal, or containment. The National Contingency Plan similarly requires that the method and cost of mitigating adverse impacts be taken into account and that alternatives that have significant adverse effects with very limited environmental benefits should be excluded from further consideration. 40 C.F.R. § 300.68(g)(3), and (h)(vi). EPA has not provided any information in this record explaining how it proposes to mitigate the adverse impacts from this massive construction and excavation project, which will unavoidably increase lead emissions in the Granite City community. Nor has it provided valid scientific support for the implementation of a 500 ppm clean-up level. The failure to analyze the

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18 In addition, EPA has not analyzed the impact on surface water and groundwater from its proposed use of wetting agents and surfactants to control dust during excavation. The cost of purchasing these materials as well as treating their discharge has not been addressed or included in EPA's cost estimate.

consequences of Alternative H on the Granite City community or justify the use of a 500 ppm clean-up level not only violates CERCLA, but the public's trust in EPA.

VII. CONCLUSION

NL has demonstrated in these comments that EPA's selection of Proposed Alternative H has no valid technical or scientific justification and falls far short of CERCLA's requirement of a cost effective remedy which will protect public health and the environment. In contrast, Alternative D will not only protect the residents of the Granite City community and the surrounding environment, it is cost effective and technically feasible in terms of project duration and ability to remedy and prevent future releases of lead into the environment.

NL performed a three-pronged site-specific risk assessment with detailed scientific references and provided the Agencies with numerous recent studies and information on lead exposure in support of the implementation of Alternative D. To support Alternative H, EPA relied on extremely limited data, which consisted of generic vegetable uptake studies irrelevant to the site, an outdated lead exposure review, a Superfund Record of Decision and a pilot program for lead remediation which has not even been completed. These comments demonstrate that each of these studies was irrelevant to Granite City conditions and/or based on outdated information on lead exposure prior to the phasedown of leaded fuels. Morover, EPA has completely failed to address the substantial adverse impacts on the community from the enormous excavation and construction required in Alternative H or the methods to mitigate such impacts.

When the record is reviewed as a whole, it is clear that EPA has no support for the selection of Alternative H as a remedy at the Taracorp site. Selection of such remedy and rejection of Alternative D is arbitrary and capricious, violating the requirements of CERCLA and the Administrative Procedure Act governing federal agency action.

REFERENCES CITED

ATSDR. 1988. Toxicological Profile for Lead (draft). Agency for Toxic Substances and Disease Registry. U.S. Public Health Service. Atlanta, GA.

Bassuk, N.L. 1986. Reducing Lead Uptake in Lettuce. *HortScience*. 21:993-995.

Binder, S., D. Sokal, and D. Maughan. 1986. Estimating Soil Ingestion: The Use of Tracer Elements in Estimating the Amount of Soil Ingested by Young Children. Arch. Environ. Health. 41: 341-345.

Budavari, S. 1989. The Merck Index. 11th ed. pages 852-853. Merck & Co., Inc. Rahway, NJ.

Cincinnati Soil Lead Demonstration Project, EPA No. V00 5035-01.

Clark, et al., The Cincinatti Soil-Lead Abatement Demonstration Project. Proceedings of Lead in Soil: Issues and Guidelines, Supp. to Vol. 9 (1989). Environmental GeoChemistry and Health.

Clausing, P., B. Brunekreef, J.H. Van Wijnen. 1987. A Method for Estimating Soil Ingestion by Children. Int. Arch. of Occup. Environ. Health. 59:73-82.

Duggan M. 1980. Lead in Urban Dust: An Assessment. Water, Air, and Soil Pollution. 14: 309-321.

EFH. 1989. Exposure Factors Handbook. U.S. EPA Office of Health and Environmental Assessment, Washington, DC 20460. EPA/600/8-89/043. July 1989.

HHEM. 1989. Risk Assessment Guidance for Superfund. Volume I. Human Health Evaluation Manual (Part A). Interim Final. page 6-31. U.S. EPA Office of Emergency and Remedial Response, Washington, DC 20460.

IEPA. 1983. *Study of Lead Pollution in Granite City, Madison and Venice, Illinois*. Illinois Environmental Protection Agency, Springfield, IL 62706. April, 1983.

Johnson, T. and L. Wijnberg. 1988. Statistical analysis of lead exposure data collected in East Helena, Montana: Draft report. PEI Associates, Inc. Durham, N.C., January, 1988. (as cited in U.S. EPA 1989).

Logan, T.J. and R.L. Chaney. 1983. Proceedings of the 1983 Workshop on Utilization of Municipal Wastewater and Sludge on Land. Eds. A.L. Page et al. pages 256-257. University of California. Riverside, CA.

Madhavan, S., K.D. Rosenman, and T. Shehata. 1989. Lead in Soil: Recommended Maximum Permissible Levels. Environ. Research. 49:136-142.

O'Flaherty, E.J. 1981. Toxicants and Drugs: Kinetics and Dynamics. page 287. John Wiley & Sons, New York, NY.

Rabinowitz, M.B.and D.C. Bellinger. 1988. Soil Blood-Lead Relationship Among Boston Children. Bull. Environ. Contam. Toxicol. 41:791-797.

Spittler, T.M. and W.A. Feder. 1979. A Study of Soil Contamination and Plant Lead Uptake in Boston Urban Gardens. Commun. Soil Sci. Plant Anal. 10:1195-1210.

Stark, A.D., R.F. Quah, J.W. Meigs, E.R. DeLouise. 1982. The Relationship of Environmental Lead to Blood-Lead Levels in Children. Env. Res. 27:373-383.

U.S. EPA. 1986. Air Quality Criteria for Lead. U.S. Environmental Protection Agency, ECAO/ORD. Research Triangle Park, NC 27711. EPA-600/8-83/028dF. June 1986.

U.S. EPA. 1989. Review of the National Ambient Air Quality Standards for Lead: Exposure Analysis Methodology and Validation. (OAQPS Staff Report). U.S. Environmental Protection Agency. Office of Air Quality. Research Triangle Park, NC 27711. EPA-450/2-89-011. June 1989.

Weast, R.C. 1973. Handbook of Chemistry and Physics. 54th ed. page B-101. CRC Press. Cleveland, OH.